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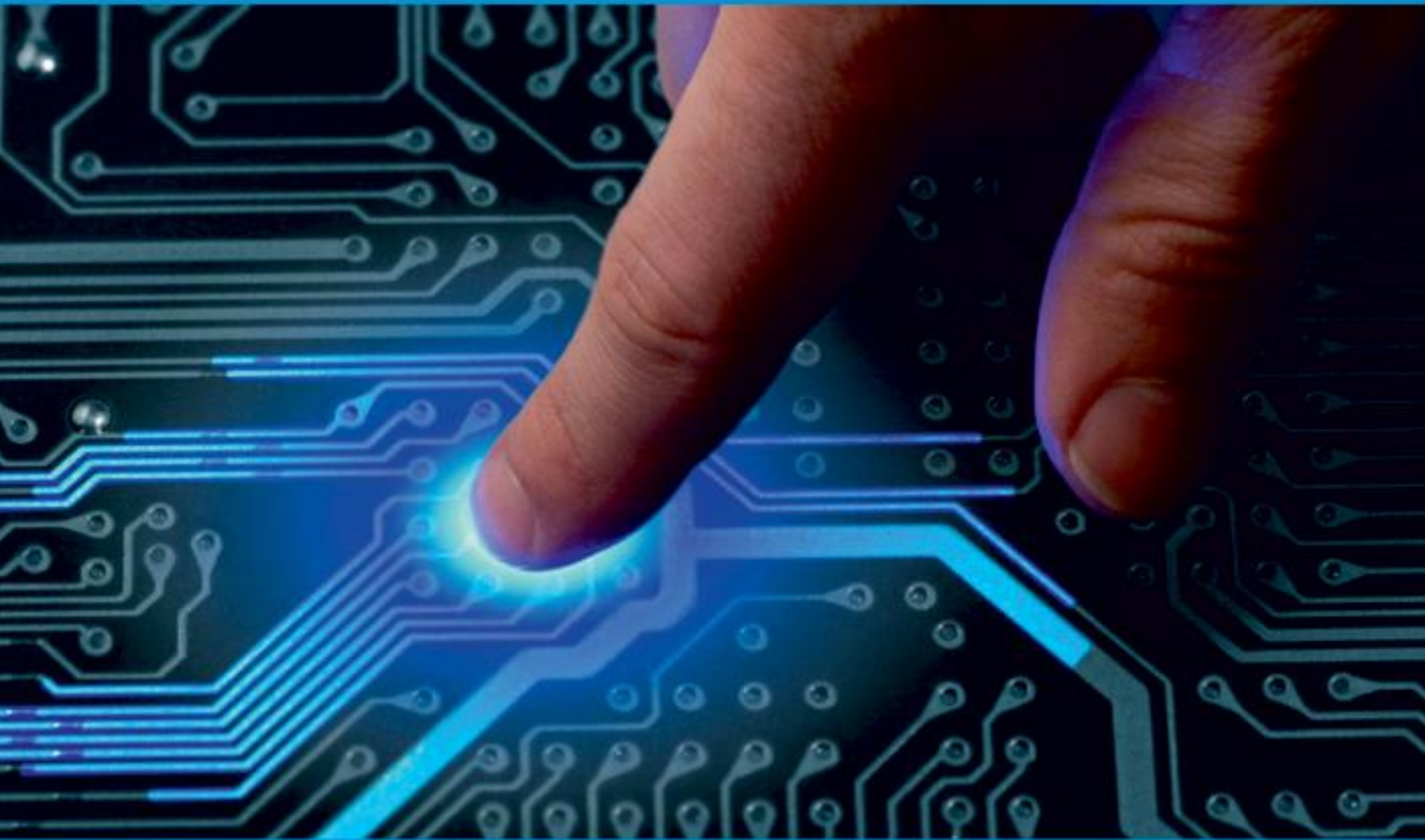

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Identification of a Person by Multimodal Approach for Surveillance Purpose using AI

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ABSTRACT: The rapidly expanding paradigm for delivering resources to consumers via the internet is called cloud computing. A promising field of research to investigate for enhancing cloud security is multimodal biometrics.The three different biometric modalities used in this study's innovative multimodal biometrics fusion system are face, ear, and gait. Each biometric modality is classified using an artificial neural network (ANN). We have successfully tested our new method using multiple participant-like photos from three databases are Ear, Face, Gait Databases. Before attempting the merge a combination of the face, ear, and gait has been found to provide improved accuracy.

KEYWORDS: Dataset Face, Ear, Gait, Deep learning algorithms

I. INTRODUCTION

A complex computer environment known as "cloud computing" provides users with easy, on-demand network connectivity across a range of devices. Customers can obtain services within the cloud ecosystem that are tailored to their requirements, free from concerns about hosting or delivery methods.

Strong authentication techniques are required to provide secure access to cloud data because attackers may attempt to obtain extremely sensitive user data that is kept in the cloud. Using a security technique to establish identity is known as authentication. Conventional authentication procedures fall into two categories. Although users who leave their token unattended might benefit from the latter, the former is vulnerable to several types of attacks, including as web-based, phishing, brute force, and shoulder surfing attacks. This is due to the fact that the attacker would have access to the same rights as the user if the token were taken.

Users that leave their token unattended would not benefit from the latter, as the stolen token would provide the attacker access to the same privileges as the user.

Traditional approaches are often thought to be less dependable and unsuitable for use in a variety of security-related applications. The primary benefit of biometrics is their inability to be lost, forgotten, or stolen.

Biometrics can be divided into two categories namely unimodal biometrics, which only take into account feature vectors for one biometric trait, and multimodal biometrics, which integrate feature vectors from several traits. The process of connecting feature vectors from dissimilar biometrics to achieve high security is known as biometric fusion advancement. Unimodal biometrics are less intricate and more accessible to implement, although which renders them inadequate in the contemporary security scenario. According to Rane et al. (2013), some high-end technology may even provide multimodal biometric authentication. Modern mobile equipment even comes with a secured biometric pattern. Sometimes a single biometric measurement is insufficient to establish a person's identity. It is possible to achieve greater recital consistency through combining many modalities. In recent times, multimodal biometric received an extensive amount of interest since it has its theoretical difficulties and fascinating functions.

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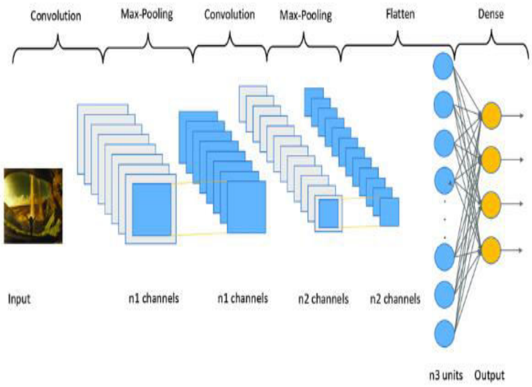

Fig1:Architecture of Convolutional Neural Network

By connecting two or more biometric features, one can obtain a multimodal biometric. It improves the level of security for applications that demand the highest level of authenticity. It might involve opening a vault that holds the customer's precious cash. Features play a crucial role in achieving a secure and uncompromised fusion. Combining Feature fusion is the procedure of integrating two or more feature vectors to generate a single feature vector that is more discriminative than any of the input feature vectors.

At the epicenter, scoring, or decision levels, feature fusion can be finished.

II. LITERATURE SURVEY

1. Strategies for biometric feature reduction based on evolution and genetics

Compared to more conventional techniques of person authentication, biometrics provides higher security and convenience. Recently, several biometrics have become popular as a more reliable and effective method of person authentication. Utilising data from various biometric traits enhances person authentication's robustness and performance. This work aims trustworthy by utilising speech and signature biometric traits.In order to build a speaker-based unimodal system, Using Gaussian Mixture Modelling (GMM) and Vector Quantization (VQ) approaches, the MFCCs and WOCORs from the training data are modelled. A unimodal system based on signatures is created utilising Features include the DCT, VPP, and HPP. These two unimodal systems are then used to construct a bimodal biometric person authentication system. According to experimental findings, bimodal person authentication systems outperform unimodal ones in terms of performance. Finally, the resilience of the bimodal system is assessed using both the noisy data and the data gathered from actual situations. When compared to unimodal person authentication systems, the bimodal system is more resilient.

2.Finger knuckle prints are used in an efficient recognition system that combines sift and surf matching scores.

Presents a distinctive collection of local-local information for a trustworthy, long-lasting and capable of rotation and translation. Texture has been enhanced and the non-uniform brightness of the FKP generated by the surface's relative curvature is addressed. Using the speeded up robust features (SURF) and the scale invariant feature transform (SIFT), the local features of the upgraded FKP are retrieved. The nearest-neighbor-ratio method is used to match the enrolled and query FKPs' corresponding features. The resulting SIFT and SURF matching scores are then merged using the weighted sum rule. The PolyU FKP database, which contains 7920 images, is used to assess the suggested system in both identification and verification modes. The system's observed performance is 100% CRR and 0.215% EER. Additionally, it is tested with different query picture scales and rotations, and it is shown to be reliable for query photos that are downscaled by up to 60% and in any orientation.

3.Using Choquet Integral and Genetic Algorithm for Multimodal Biometric Authentication.

Assuming the fuzzy parameters that follow together with it are carefully selected, the TheChoquet integral is a very useful tool for fusing information. In this work, we present a unique method for computing fuzzy measures related to the Choquet integral in multimodal biometrics contexts involving data fusion. Genetic algorithms form the basis of the suggested methodology. Two databases have been used for validation: one is based on synthetic scores, while the other

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is biometric and relates to face, fingerprint, and palmprint. The obtained findings verify the resilience of the suggested methodology.

4. A bimodal biometric system that recognises hand forms and palmprints makes use of SIFT sparse representation.

Because it is easy to use and widely accepted, hand shape biometry is one of the most often used biometrics to characterise a person in forensic applications. Nevertheless, this method has flaws that could lead to system inaccuracies. In actuality, identical twins or members of the same family may share hand characteristics. As a result, the hand descriptors have a major influence on how well the hand verification process works. Our work presents a novel method for personal verification that integrates information from the palmprint and hand shape, which are derived through the use of the SIFT. This transform's excellent distinctiveness and efficiency were enhanced for a variety of applications, particularly video tracking and object detection.

By combining the hand shape and palm print modalities at a matching level score, our investigations on the IITD hand database show encouraging results. When compared to similar bimodal identification techniques, their findings are comparable.

5.Feature-based terrain classification for Little Dog.

Color-based classification and 3D sensing algorithms have emerged as the primary components of recent work in terrain classification. We provide a method that resilient to variations in illumination utilizing a single, inexpensive camera. Using a SVM classifier, constructed is employed to classify terrain. We provide an assortment of innovative techniques for enhancing this approach.

To achieve a nominal feature density, the SURF Hessian threshold is adjusted using an approach influenced by gradient descent. High-resolution photos of heterogeneous terrain are also classified using a sliding window method. We show that our method works well for small-legged robots by using Little Dog to do real-time terrain categorization. The classifier is employed to choose from preset gaits for navigating uneven terrain. The findings show that employing a single all-terrain gait is slower than real-time classification in-the-loop.

III. METHODOLOGY

There are several well-defined steps in the process of feature vector extraction and optimisation in multimodal biometrics, which uses artificial neural networks to process face, ear, and gait modalities.

Initially, comprehensive data collection is carried out using high-resolution cameras and sensors to capture face images, ear images, and gait videos under diverse conditions. Following this, preprocessing steps are applied to enhance the quality and standardize the raw biometric data. For face images, preprocessing includes face detection, alignment based on facial landmarks, normalization of brightness and contrast, and noise reduction using filters. Ear images undergo detection, segmentation, and normalization, while gait videos are processed through background subtraction and silhouette extraction to focus on the individual's walking pattern. Feature extraction is then performed using advanced neural network architectures tailored for each biometric modality. Convolutional Neural Networks (CNNs) are employed to extract robust feature vectors from face and ear images, capturing unique characteristics and patterns. For gait sequences, are utilized to capture temporal features. The extracted feature vectors from face, ear, and gait are subsequently fused and optimized. Methods for reducing dimensionality such as retain only most discriminative features, and various fusion methods such as concatenation, weighted sum, or neural network-based fusion are used to combine the feature vectors effectively.

Subsequently, solutions based on neural networks, Particle Swarm Optimisation, and Genetic Algorithms are employed to lower the complexity of information technology and improve the discriminative ability of the composite feature vector.

Eventually, machine learning classifiers that were originally trained to map feature vectors to identities—like convolutional neural networks—are used to classify the optimized feature vector.

Reliable recognition results are produced by the classification results that are subsequently used to reach the ultimate decision regarding the individual's identity or verification. With this methodological approach, multimodal biometric systems can achieve high accuracy, adaptability, and efficiency through applying the abilities of artificial neural networks, which renders them useful in an extensive variety of applications.

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IV. OBJECTIVE

The objective of this system is to enhance the accuracy, robustness, and efficiency of biometric recognition systems by leveraging all the classes in the dataset. By employing artificial neural networks for feature extraction and optimization, the system aims to overcome the limitations associated with using a single biometric modality and provide a more secure and reliable means of identifying and verifying individuals.

Dataflow Diagram

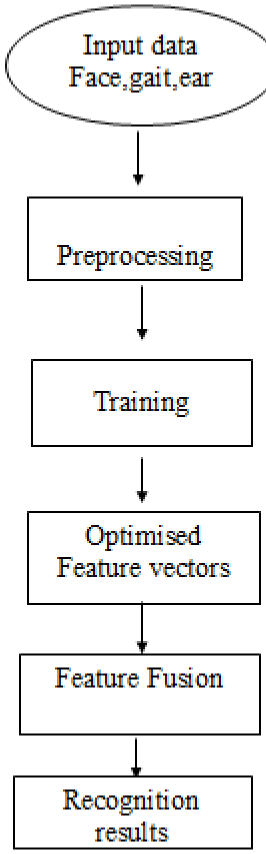

Fig2: Dataflow diagram

The system starts with three types of biometric input data: face images, ear images, and gait videos, Sources: The input data can be collected using camerasPreprocessing
Description:

Dataset collection
The raw biometric data needs to be preprocessed to improve the quality and to standardize the data for feature extraction.

Data Preprocessing
Sub-processes-Face Preprocessing: Face Detection: Identifies and isolates the face in an image using algorithms CNN. Cropping and Alignment: Aligns the face based on detected landmarks. Normalization: Adjusts the brightness and contrast of the face image.

Noise Reduction: Removes noise using filters. Ear Preprocessing: Ear Detection: Detects and isolates the ear in an image using CNN-based detectors.Segmentation: Separates the ear from the background.
Normalization: Adjusts the brightness and contrast.

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Gait Preprocessing: Background Subtraction: Removes the background to focus on the silhouette of the person.Silhouette Extraction: Isolates the silhouette of the walking person. Outputs: Preprocessed face images, preprocessed ear images, preprocessed gait sequences.

Feature Extraction
Description: Extracts distinctive features from the preprocessed data using neural networks.Sub-processes:Face Feature Extraction:Uses Convolutional Neural Networks (CNNs) to extract facial features.

The output is a face feature vector.Ear Feature Extraction:Uses CNNs to extract ear features.The output is an ear feature vector.

Gait Feature Extraction: Uses Convolutional Neural Networks (CNNs) to capture temporal features from gait sequences.The output is a gait feature vector.Outputs: Face feature vectors, ear feature vectors, gait feature vectors.

Feature Fusion
Description: Combines the feature vectors from different biometric modalities into a single, optimized feature vector.Sub-processes:DimensionalityReduction:FeatureFusion: Combines the reduced feature vectors using concatenation, weighted sum, or neural network-based methods.Outputs: Optimized multimodal feature vector.

Classification
Description: Uses the optimized feature vector to classify and recognize the identity of the person. Classification:Uses classifiers such as other machine learning classifiers.The classifier assigns a label or score to the feature vector.

Recognition:
Makes a decision based on the classifier's output, identifying or verifying the person.
Outputs: Recognition results, which could be the identity of the person or a verification result.

V. RESULTS

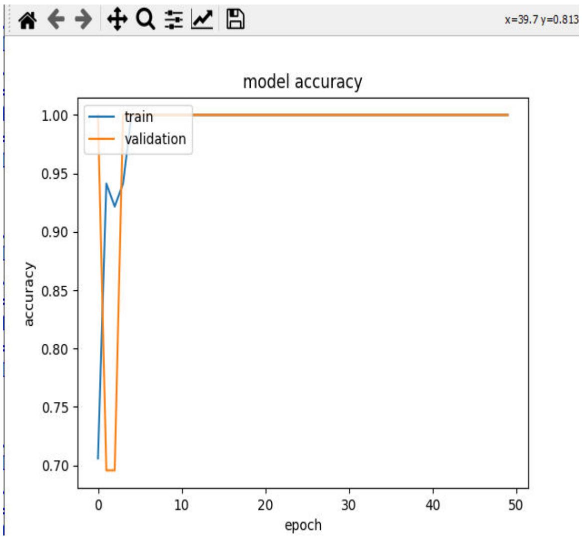

Fig 3:Accuracy graph

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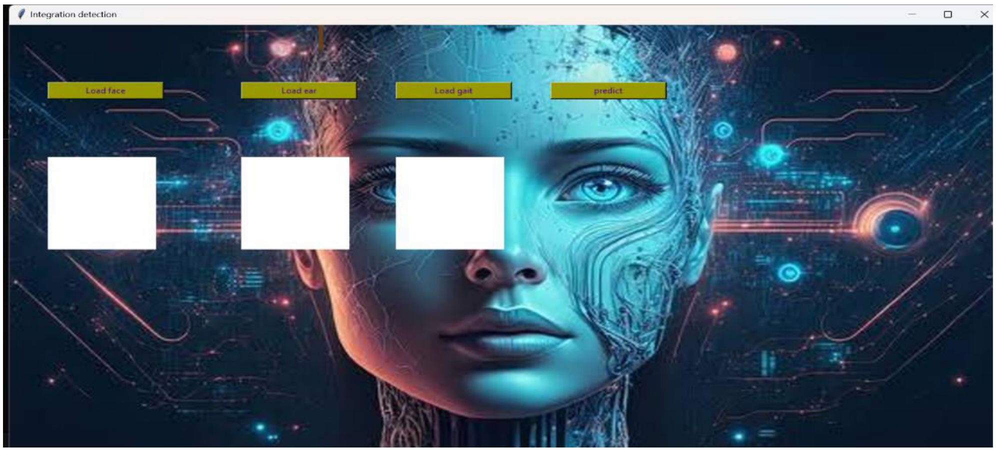

Fig4: Graphical User Interface

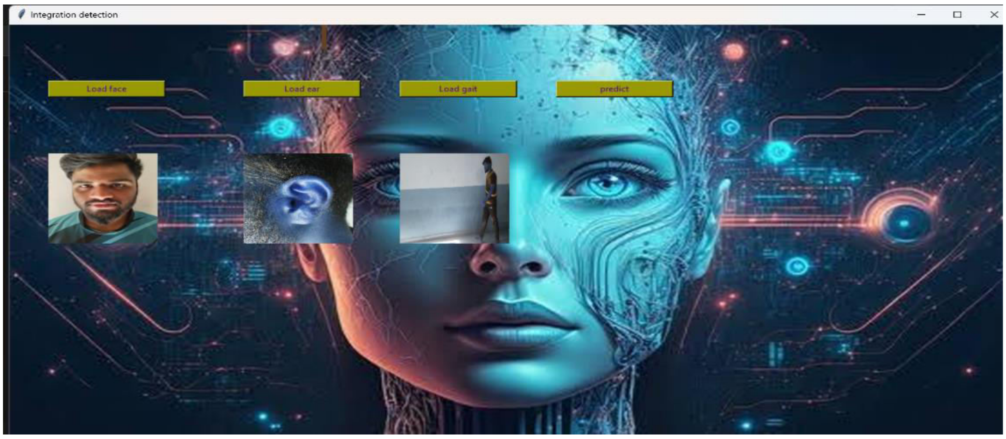

Fig5:upload biometric images

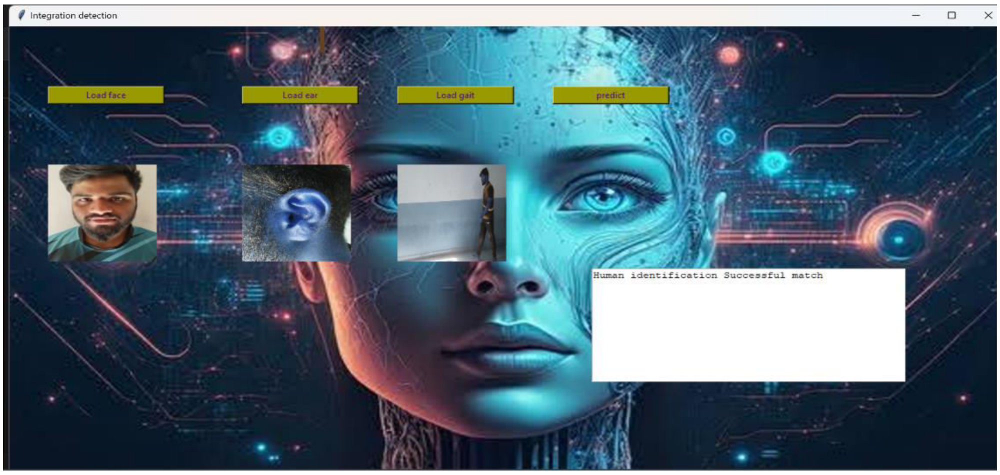

Fig6:Displays successful match

VI. CONCLUSION

The volume of private and sensitive data being stored on cloud servers has increased dramatically, making it imperative that end users have secure access to their data. This research demonstrated the extraction of biometric

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features and the cross-validation procedure of human attributes that can be used to enable safe cloud access. We use the face, ears, and gait in the processing. The notion employed in the biometric.

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